

Tracking Study on the Out-of-hospital Nursing and Rehabilitation Effect of Insulin Pump Treatment Patients based on Wechat Platform

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Abstract: For the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, the conventional tracking study method of out-of-hospital nursing and rehabilitation effect has some shortcomings, such as low tracking stability of rehabilitation effect and low tracking positioning of rehabilitation effect. Therefore, a tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is proposed. Based on the tracking data acquisition of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, and the introduced tracking analysis algorithm of out-of-hospital nursing and rehabilitation effect, the tracking study model of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is established. The tracking data of the out-of-hospital nursing and nursing rehabilitation effect of insulin pump treatment patients are loaded. The tracking out-of-hospital nursing and nursing rehabilitation effect of insulin pump treatment patients are processed. Thus, the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is realized. The experimental data show that after using the proposed tracking study method of the out-of-hospital nursing and rehabilitation effect, the rehabilitation effect tracking stability is improved by 40.1%, and the rehabilitation effect tracking positioning is improved by 54.6%. It is suitable for the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform.

Keywords: Wechat platform; Insulin pump; Treatment patients; Out-of-hospital nursing; Rehabilitation effect; Tracking study

1. Introduction

For the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, the conventional tracking study method of out-of-hospital nursing and rehabilitation effect has some shortcomings, such as low tracking stability of rehabilitation effect and low tracking positioning of rehabilitation effect[1]. Therefore, a tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is proposed. Based on the tracking data acquisition of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, and the introduced tracking analysis algorithm of out-of-hospital nursing and rehabilitation effect, the tracking study model of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is established. The tracking data of the out-of-hospital nursing and nursing rehabilita-

tion effect of insulin pump treatment patients are loaded. The tracking out-of-hospital nursing and nursing rehabilitation effect of insulin pump treatment patients are processed. Thus, the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is realized. In order to ensure the validity of the tracking study on the out-of-hospital nursing and rehabilitation effect, the experimental environment of out-of-hospital nursing and rehabilitation of insulin pump treatment patients based on Wechat platform is simulated. By using two different tracking study methods of the out-of-hospital nursing and rehabilitation effect, the simulation experiment about tracking stability and positioning of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is carried out. The results of the simulation experiment show that the proposed tracking study on the out-of-hospital nursing and rehabilitation effect has very high effectiveness.

2. Establishment of the Tracking Study Model of the Out-of-hospital Nursing and Rehabilitation Effect of Insulin Pump Treatment Patients based on Wechat Platform

Establishment of a tracking study model of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform mainly includes the tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients as well as the introduction of the tracking analysis algorithm of the out-of-hospital nursing and rehabilitation effect. The establishment of the tracking study model of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is realized.

2.1. Tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform

The tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is realized by the acquisition module of effect tracking data of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform. Acquisition module of effect tracking data, in short, is also known as AMOE data acquisition module. It is a hardware module based on front-end electronics and trigger/selection. It consists of reading module, online module, calibration module and other auxiliary/service module[2]. It realizes

the tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform.

AMOE data acquisition module uses advanced computer and network technology on a large scale. It serves the tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, using multi-level parallel processing scheme. The lowest level is reading nursing and rehabilitation effect based on VME bus module. The tracking data acquisition of the out-of-hospital nursing and rehabilitation effect is composed of front-end electronic reading plug-in (TDC and ADC) and a processor used as a controller. Each VME reads no more than 16 front-end electronic reading plug-ins and 1024 electronic channels. The VME processor is designed to use MVME 2431 single board computer to complete the collection, processing, monitoring and transmission of out-of-hospital nursing and rehabilitation effect tracking data. Several reading nursing rehabilitation effects are connected to the reading computer through 100M Switch of the Ethernet network, forming a reading branch. All reading branches are connected to the online computer cluster through a switch of more than 1G to form the backbone of the data stream of the data acquisition module. The sub-case data packets from each reading branch are aggregated into complete cases through an online computer cluster and tagged, processed and monitored until they are securely recorded on a permanent medium, as shown in Figure 1[3].

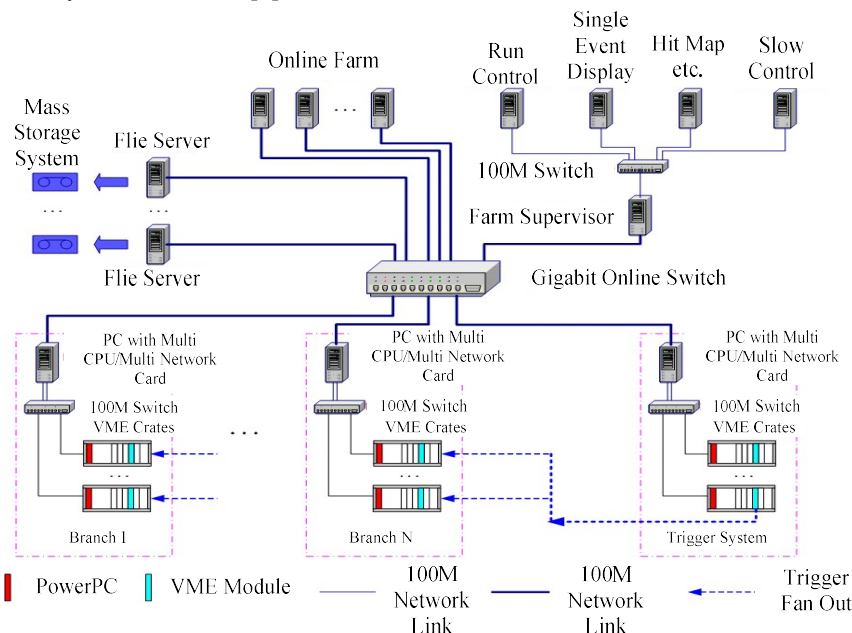


Figure 1. Diagram of AMOE data acquisition module

AMOE data acquisition module provides support for other control and test functions. In the process of module design, it is necessary to define and implement the interface and driving mode between AMOE data acquisition module and front-end electronics module and trigger module. For the tracking data acquisition of out-of-hospital nursing and rehabilitation effect[4], it should be fully considered that how to achieve the control, calibration and testing functions of the whole module and submodule, out-of-hospital nursing and rehabilitation effect tracking data parameter recording, module initialization, download of program/parameter, delivery and execution

of operation commands and a series of module service functions from the design stage.

According to the requirement information provided by the trigger module of out-of-hospital nursing and rehabilitation effect tracking data, the basic configuration of AMOE data acquisition module is shown in Table 1. The number of reading nursing rehabilitation effect is about 48, and the number of reading branches is not more than 16. It is expected that more than 30 PCs will be needed for the online computer cluster, and the large data storage module will achieve (240TByte/5 years) operation capability[5].

Table 1. Reading of the device configuration table

Submodule Name	Channel Number	Number of Plug-ins Read	Reading Nursing Rehabilitation Effect Number	Read Branch Number
MDC (T+Q)	13600	224	16	4
EMC	6272	208	16	4
TOF+CCT (T+Q)	896	28	2	1
MUC	9088	40	4	1
Trigger	400	160	10	2
Total	30256	804	48	12

Considering the uneven distribution of tracking data of out-of-hospital nursing and rehabilitation effect, the module should complete the task of data acquisition in the smallest time. It is expected that the average data passing ability of reading nursing and rehabilitation effect will reach 3.2 MBytes/sec. Therefore, the high-speed VME bus reading method and high-speed Ethernet network technology should be adopted[6].

In order to ensure that the tracking data of out-of-hospital nursing and rehabilitation effect are correctly collected and transmitted to the computer, the original case data segment should be preliminarily assembled on reading nursing rehabilitation effect and reading branches. The data reading mode and data format of front-end electronics and trigger module require more consistent design requirements in order to process and package the case data segment correctly.

2.2. Introduction of the tracking analysis algorithm of out-of-hospital nursing and rehabilitation effect

Out-of-hospital nursing and rehabilitation effect tracking analysis algorithm is developed based on big data clustering algorithm. For the tracking data acquisition of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, the tracking data objects can be divided into two categories: R-type and Q-type. R-type is tracking and processing the variable, tracking index of out-of-hospital nursing and rehabilitation effect. Q-type is tracking and processing the tracking data of out-of-hospital nursing and rehabilitation effect[7].

Firstly, establish the tracking data fuzzy relationship of out-of-hospital nursing and rehabilitation effect, and set

the proximity degree between element x_i and x_j in out-of-hospital nursing and rehabilitation effect tracking data X as the similarity coefficient r_{ij} ($r_{ij} \in [0,1]$). The fuzzy matrix $(r_{ij})_{n \times n}$ composed of similarity coefficient r_{ij} is the upper fuzzy relation in X [8].

Then, the criterion function of tracking data of out-of-hospital nursing rehabilitation effect is defined. In the fuzzy clustering analysis, for different $\lambda \in [0,1]$, different tracking classifications can be obtained, thus forming a dynamic fuzzy clustering map. However, in many practical problems, how to determine the specific classification of samples based on the value λ ? Two commonly used methods are [9]:

According to the actual needs, the value λ is determined by experts combined with professional knowledge, and the equivalence classification is obtained horizontally.

Determine the best value λ by F-statistics.

Assuming that the tracking data domain $U = \{x_1, x_2, \dots, x_n\}$ of out-of-hospital nursing and rehabilitation effect is sample space (total number of samples is n), each sample x_i has m features (m data obtained from experiment or observation) : $x_i = (x_{i1}, x_{i2}, \dots, x_{im})(i = 1, 2, \dots, n)$. The original data matrix is obtained. The central vector of the total sample can be expressed by formula (1)[10]:

$$\bar{x}_k = \frac{1}{n} \sum_{i=1}^n x_{ik} (k = 1, 2, \dots, m) \tag{1}$$

Assuming that corresponding to the value λ , the classification number of the tracking data of out-of-hospital nursing and rehabilitation effect is r . The sample number

of class j is n_j . The sample number of class j is recorded as follows: $x_1^{(j)}, x_2^{(j)}, \dots, x_{n_j}^{(j)}$, and the clustering center of class j is a vector $\bar{x}^{(j)} = (\bar{x}_1^{(j)}, \bar{x}_2^{(j)}, \dots, \bar{x}_m^{(j)})$. $\bar{x}^{(j)}$ is the average value of the k feature which can be expressed by formula (2):

$$\bar{x}_k^{(j)} = \frac{1}{n_j} \sum_{i=1}^{n_j} x_i^{(j)} \bar{x}_{ik} \quad (k=1, 2, \dots, m) \quad (2)$$

According to formulas (1) and (2), the statistic F is obtained, as is shown in formula (3):

$$F = \frac{\sum_{j=1}^r n_j \|\bar{x}^{(j)} - \bar{x}\|^2 / (r-1)}{\sum_{j=1}^r \sum_{i=1}^{n_j} \|x_i^{(j)} - \bar{x}^{(j)}\|^2 / (n-r)} \quad (3)$$

In the formula, $\|\bar{x}^{(j)} - \bar{x}\| = \sqrt{\sum_{k=1}^m (\bar{x}_k^{(j)} - \bar{x}_k)^2}$ is the distance between tracking data classes of out-of-hospital nursing and rehabilitation effect. $\|x_i^{(j)} - \bar{x}^{(j)}\|$ is the distance between samples in tracking data classes of out-of-hospital nursing and rehabilitation effect. In the formula, F distribution with degree of freedom $(r-1, n-r)$ is obeyed. Therefore, the larger the F value, the greater the distance between classes, indicating that the greater the difference between classes, the better the tracking.

If $F > F_{\alpha}(r-1, n-r) (\alpha=0.05)$, the difference between classes is significant according to the theory of mathematical statistics analysis, which shows that tracking is reasonable. If the F value in inequality $F > F_{\alpha}(r-1, n-r) (\alpha=0.05)$ is more than one, the size of difference (F - F_{α}) can be further examined. A satisfactory F value can be found from the larger ones, that is, the existence of the first problem is satisfactorily solved. The tracking study model of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is completed.

3. Realizing the Tracking Study on the Out-of-hospital Nursing and Rehabilitation Effect of Insulin Pump Treatment Patients based on Wechat Platform

3.1. Loading the tracking data of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients

Loading the tracking data of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients is realizing is to realize the high-speed loading of the case data of the front-end electronics of AMOE data acquisition module. Because the loading speed of VME bus and the network transmission speed between computer nodes that are limited by the equipment bandwidth, it is easy to form a "bottleneck" of data flow in the

module. According to the test results of specific I/O devices, MVME2431 processor is used to program access to VME devices. The time period of a single direct "read" operation is more than $1 \mu s$ second (800ns is the time occupied by the processor, and the rest is the time occupied by the device). The loading speed of 32Bit is up to 3M Bytes/sec. The loading speed of 32Bit in DMA mode can reach above 13M Bytes/Sec (i.e., less than 300ns per reading cycle). Therefore, DMA mode is chosen to load out-of-hospital nursing and rehabilitation effect tracking data to meet the needs of AMOE data acquisition module.

The ability of network transmission is also related to the loading of tracking data of out-of-hospital nursing and rehabilitation effect. According to the test, the transmission speed of point-to-point 100M network can reach 10M Bytes/sec. In order to achieve such a high speed, in addition to using 12-port 100M Switch, the multiple NIC scheme should be adopted on the computer. Another gigabit network card loaded on the computer is connected to the online gigabit Switch. The main functions of the load branch constructed by this method are:

Collect the case data fragments loaded into the nursing and rehabilitation effect, and compose the marked sub-case data package; The control and transmission of data and command flow; Realize the transmission of case data flow from 100M network segment to 1G network segment, and finally reach online computer cluster quickly and safely.

The performance of out-of-hospital nursing and rehabilitation effect tracking data loading mainly depends on the data passing ability of inputting nursing and rehabilitation effect. That is the comprehensive ability of completing VME bus data loading, data preprocessing and data network sending in unit time. Data preprocessing can effectively compress redundant headers, tails and trigger numbers by preliminary case assembly, thus reducing the pressure of data network transmission. The data passing ability of out-of-hospital nursing and rehabilitation effect tracking data is related to the design of front-end electronic plug-in. According to the current design of the scheme for loading the tracking data of out-of-hospital nursing and rehabilitation effect in electronics, the topological diagram of the AMOE data loading case assembly is shown in Figure 2.

The VME processor MVME2431 with good performance/price ratio is selected as the controller to load the tracking data of out-of-hospital nursing and rehabilitation effect. The processor uses PowerPC- 750 as MPU and has 350MHz clock, 32M memory, 9M flash memory, 10M/100M network port, D64 (MBLT)/D32/D16/D8 VME-PCI bus interface and DMA controller. The main function of the nursing and rehabilitation effect controller is to complete the task of high-speed data loading. In addition, download software, load configuration, inter-

rupt processing, task scheduling, equipment control, monitoring, calibration, debugging, local testing and oth-

er functions also need to be completed. The above configuration can basically meet the design needs.

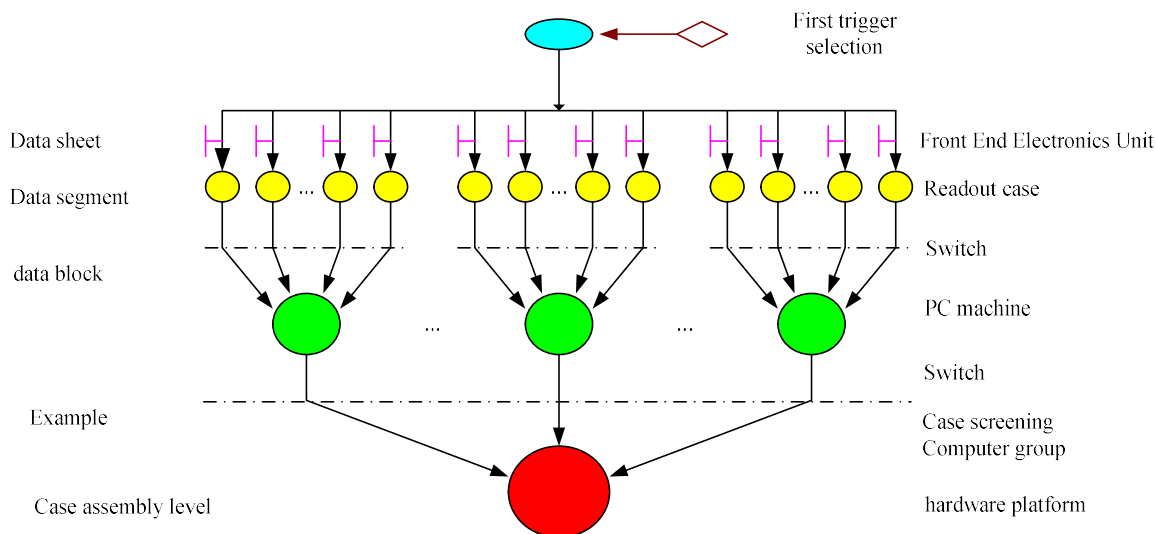


Figure 2. Topological diagram of AMOE data loading case assembly

3.2. Tracking treatment of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients

The tracking treatment of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform transmits the case data after the first trigger selection to online computer cluster for case assembly and screening (software trigger). Finally send the case data triggered by software to the computing center to write in the storage medium. The tracking treatment of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients is described as follows:

After loading the PC to assemble the data at the branch level, notify the online cluster manager that a case data block of a case number is ready for loading.

On-line cluster manager receives all the cases sent by the loaded PC, and then notifies the idle cluster node n to load the data block corresponding to the case number.

The cluster node n loads data blocks corresponding to case numbers from all loaded PCs.

The case data block is assembled, formatted, filtered and classified by cluster node n. The results are sent to the online file server.

After receiving the case data from the cluster node n, the online file server notifies the online cluster manager that the data of the case number has been processed. After accumulating certain cases, the server stores them and transfers them to the computing center for tape recording. Insulin pump treatment of patients with out-of-hospital nursing and rehabilitation effect tracking computer cluster node n is informed. All loaded PC release correspond-

ing case number data cache. The data flow chart of AMOE out-of-hospital nursing and rehabilitation effect tracking processing is shown in Figure 3.

Insulin pump treatment patients with out-of-hospital nursing and rehabilitation effect tracking online computer cluster manager selects rehabilitation effect tracking high positioning workstation. There are two queues in the cluster manager. One is the queue of case numbers to be assembled from the loaded PC, and the other is the queue of idle nodes from the cluster. According to these two queues, the cluster manager notifies the designated cluster nodes to read the data blocks of an event from each loaded PC. It must be ensured that the data blocks of the same case number are transmitted to the same cluster node. All data processing tasks are completed at the computer cluster node. The tracking treatment of the out-of-hospital nursing and rehabilitation effect of insulin pump patients is realized. The tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform is completed.

4. Experimental Results and Analysis

In order to ensure the validity of the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform, the simulation experiment is carried out and analyzed. In the course of the experiment, different out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on Wechat platform are used as the experimental objects. The rehabilitation effect tracking stability and rehabilitation effect tracking positioning simula-

tion experiment are carried out. The cause, severity and personal health of the patients who received the treatment of insulin pump on Wechat platform are simulated. In order to ensure the validity of the experiment, the con-

ventional out-of-hospital nursing and rehabilitation effect tracking research method is used as the comparative object to compare the two simulation test results. The experimental data are presented in the same data chart.

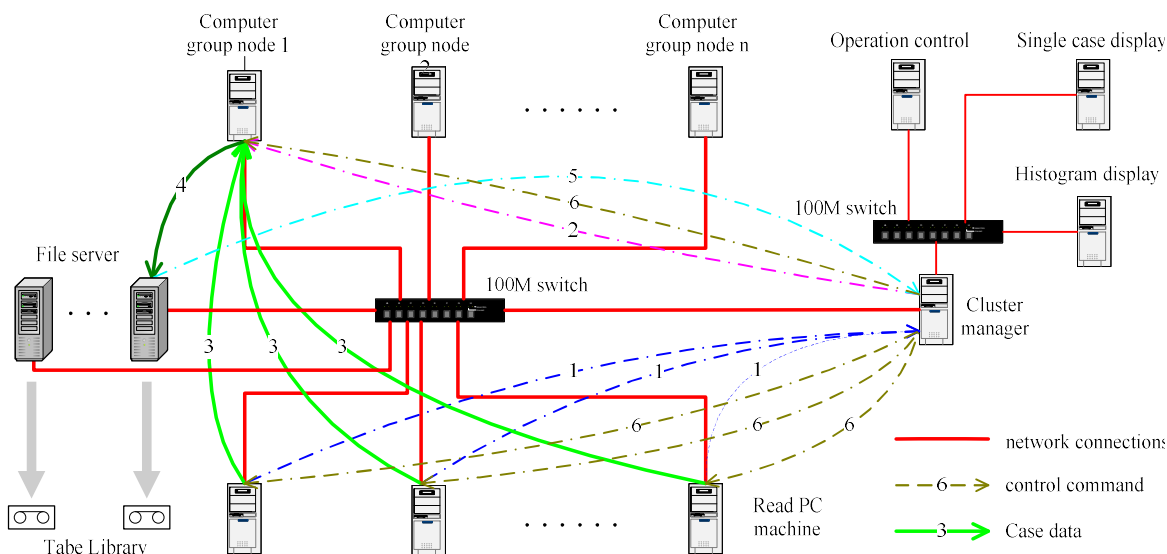


Figure 3. Data flow chart of AMOE out-of-hospital nursing rehabilitation effect tracking processing

4.1. Rehabilitation effect tracking stability comparison

During the experiment, two different out-of-hospital nursing and rehabilitation effect tracking studies are used to work in a simulated environment. The tracking stabi-

ty of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform is analyzed. The comparison results of the test results are shown in Table 2.

Table 2. Rehabilitation effect tracking stability comparison table

Case Type Number	Tracking Research Method of Rehabilitation Effect of Conventional Out-hospital Nursing	A Method of Follow-up Study on Rehabilitation Effect of Out-of-hospital Nursing
1#	48.6	96.5
2#	57.9	98.5
3#	52.1	94.1
4#	56.3	98.1
5#	61.5	94.8
6#	62.6	97.6

For the proposed tracking study on the out-of-hospital nursing and rehabilitation effect and the conventional tracking study method of the out-of-hospital nursing and rehabilitation effect, their tracking stabilities of nursing and rehabilitation effect are dealt with the arithmetic mean value. It is concluded that of the tracking stability of the conventional out-of-hospital nursing and rehabilitation effect is 56.5%. The tracking stability of the proposed out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform is 96.6%. The tracking stability of the proposed out-of-hospital nursing and rehabilitation effect is 40.1% higher than that of the conventional one.

4.2. Rehabilitation effect tracking positioning comparison

In the course of the experiment, two different kinds of out-of-hospital nursing and rehabilitation effect tracking researches are used to work in the simulated environment. The tracking positioning change of out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform is analyzed. The comparison curves of the experiment results are shown in Figure 4.

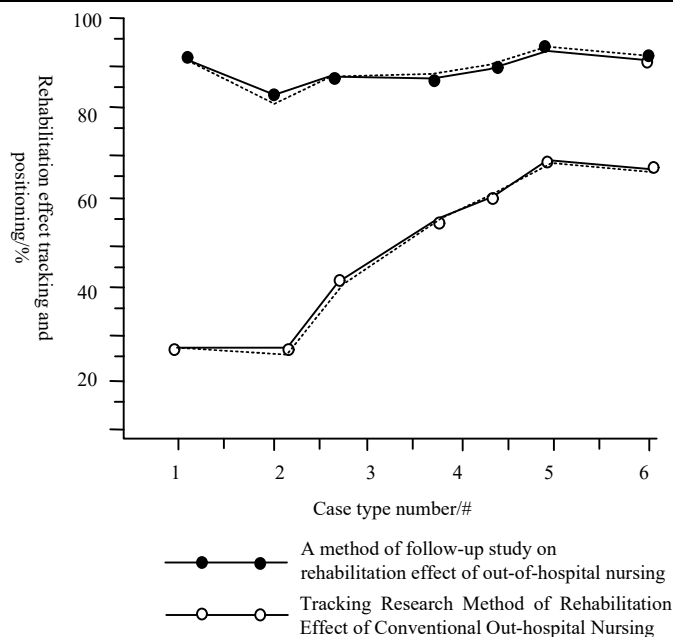


Figure 4. Rehabilitation effect tracking positioning comparison curve

For the proposed tracking study on the out-of-hospital nursing and rehabilitation effect and the conventional tracking study method of the out-of-hospital nursing and rehabilitation effect, their tracking positionings of nursing and rehabilitation effect are dealt with the arithmetic mean value. It is concluded that of the tracking positioning of the conventional out-of-hospital nursing and rehabilitation effect is 40.5%. The tracking positioning of the proposed out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform is 95.1%. The tracking positioning of the proposed out-of-hospital nursing and rehabilitation effect is 54.6% higher than that of the conventional one. It is suitable for the tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform.

5. Conclusion

This paper presents a tracking study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform. Through the construction of the tracking study model of the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients based on the Wechat platform as well as the loading and tracking treatment of data, this paper is completed. The experimental data show that the method designed in this paper is highly effective. It is hoped that this study can provide a theoretical basis for the follow-up study on the out-of-hospital nursing and rehabilitation effect of insulin pump treatment patients.

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